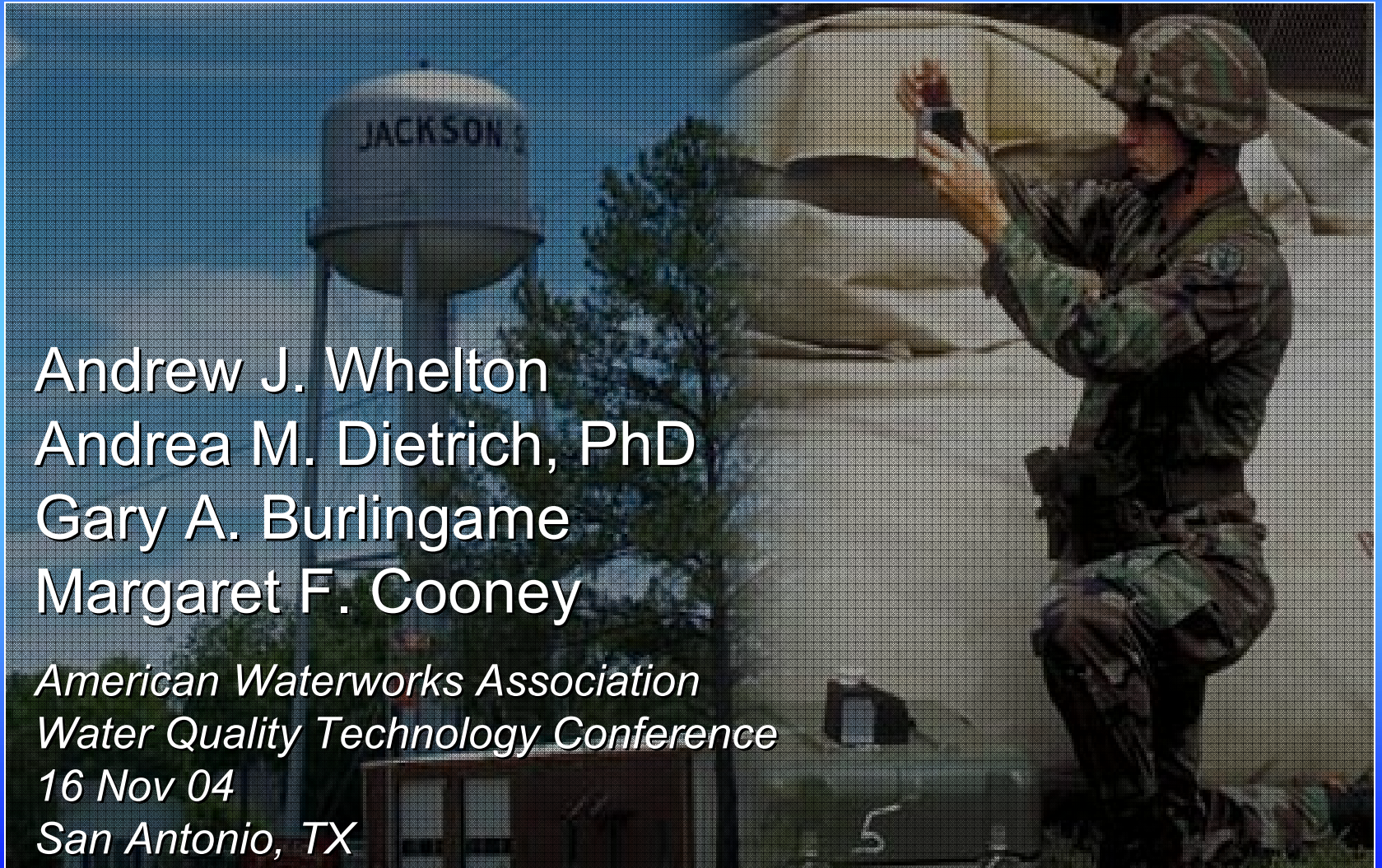


Detecting Contaminated Drinking Water: Harnessing Consumer Complaints

Andrew J. Whelton
Andrea M. Dietrich, PhD
Gary A. Burlingame
Margaret F. Cooney

*American Waterworks Association
Water Quality Technology Conference
16 Nov 04
San Antonio, TX*



Overview

1. About the USACHPPM
2. Consumer Feedback
3. Real World Case Studies
4. Feedback Management
5. Conclusions



USACHPPM

Readiness thru Health

US Army Center for Health Promotion and Preventive Medicine

Headquarters

APG-EA, MD

Field Offices

Ft. Meade, MD

Ft. McPherson, GA

Ft. Lewis, WA

Camp Zama, Japan

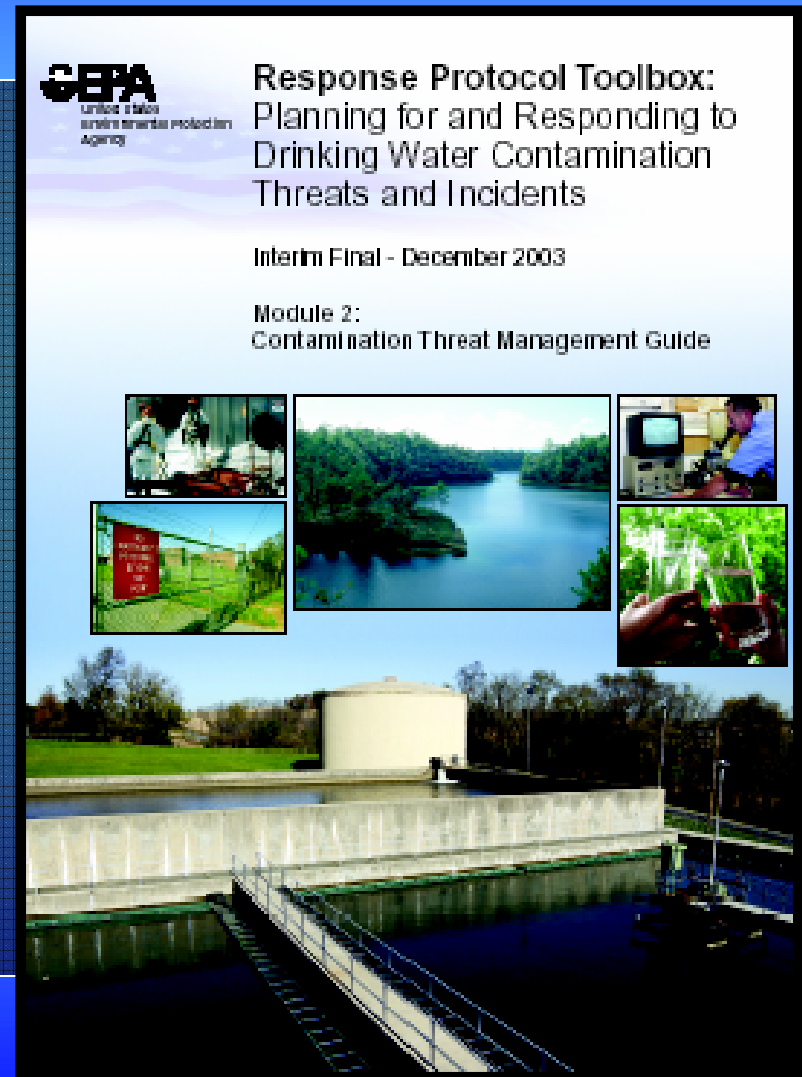
Landstuhl, Germany

Safe Drinking Water Powers Our Ultimate Weapon

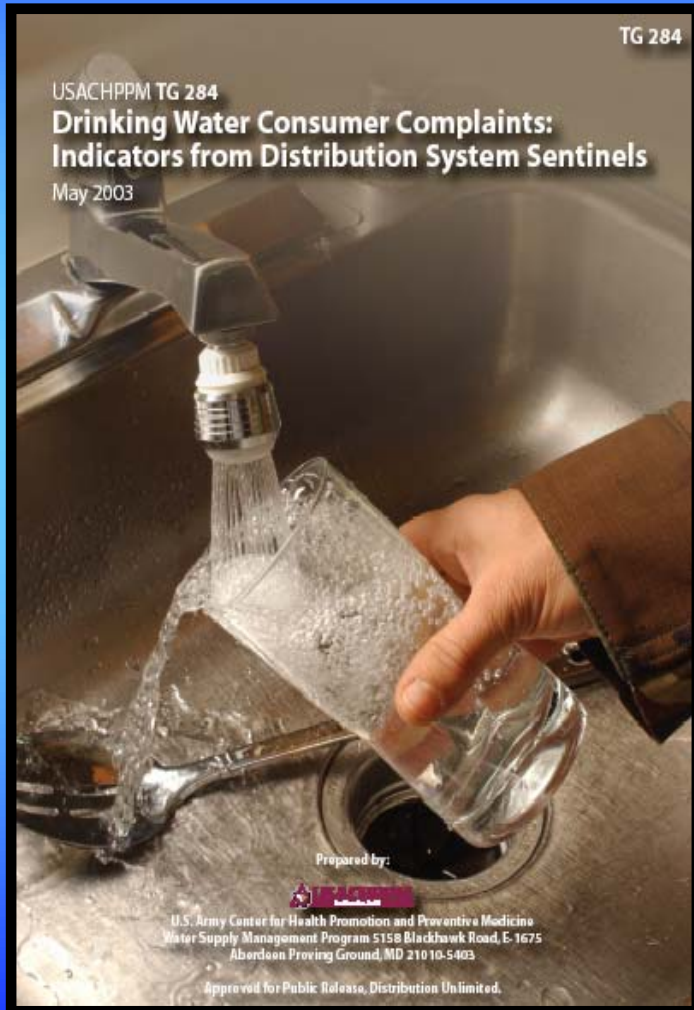


Consumer Complaint Monitoring is Endorsed by US EPA and CDC

- EPA Contamination Threat Management Guide
- Expert CDC and EPA forum
 - Databases highlighted as a frontline tool for contaminated water detection
 - Recommended integration of utility information into a larger surveillance tool



Consumer Complaint Monitoring is Important on Military Installations



Technical Guide 284, Drinking Water Consumer Complaints: Indicators from Distribution System Sentinels.

United States Army Center for Health Promotion and Preventive Medicine, APG, MD USA. 2002.

To obtain a copy:

Download at:

<http://chppm-www.apgea.army.mil/tg.htm>

Or send an e-request:

Water.Supply@apg.amedd.army.mil

Consumer Complaint Monitoring is Important in Military Operations

Drinking Water Tampering Battlefield Response Protocol

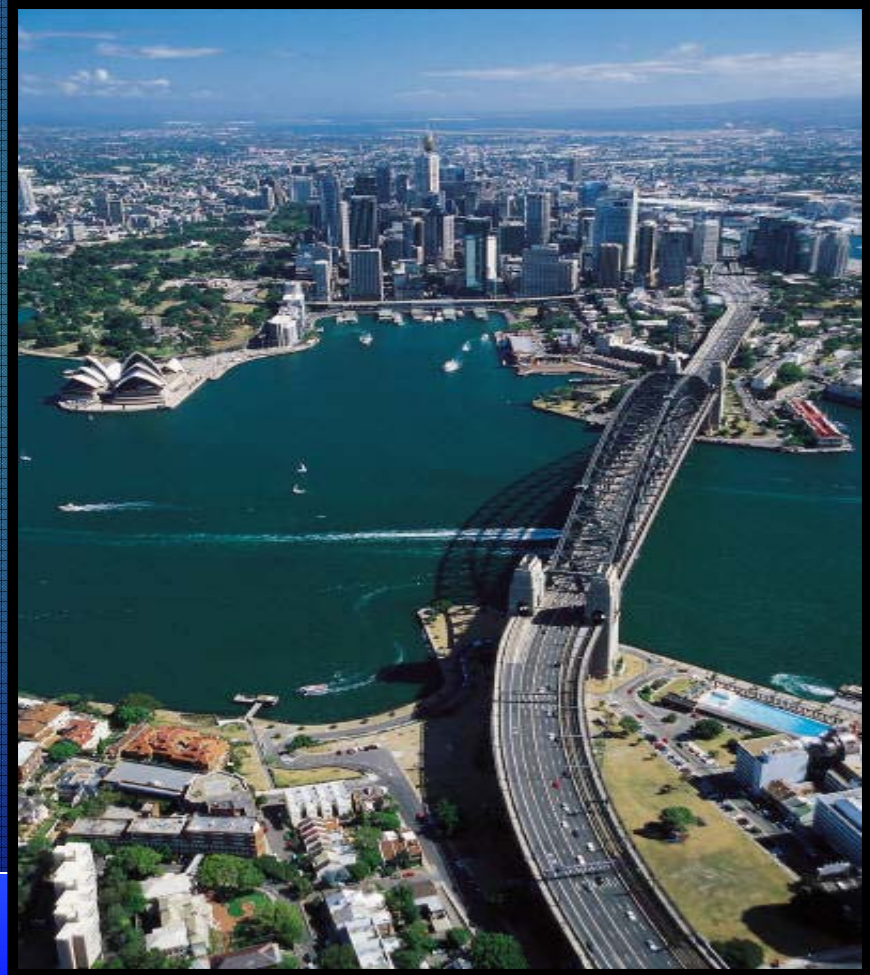
United States Army Center for
Health Promotion and Preventive
Medicine, APG, MD USA. 2004.

To obtain a copy:
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Health Officials Speculate Population Behavior will Indicate a Terrorist Attack

- Detection via tracking
 - ER visits
 - Medicine purchases
 - School and work absenteeism
- Syndromic surveillance systems
 - Track occurrence of disease signs and symptoms



Consumer Feedback Suggests Different or Unacceptable Drinking Water



- Complaints are related to tap water quality
 - Usually fear based
 - Voicing dissatisfaction
- Types
 - Aesthetic
 - Illness
 - Pressure
 - Suspicious activity

Some Terrorist Choice Chemicals have Aesthetic Attributes

Compound Name	Taste Descriptor	Odor Descriptor	Color Descriptor	Turbidity Present
Cyanogen chloride	Sharp, metallic	Pepperish	Colorless	No
Diazinon (insecticide)	Not found	Faint ester-like	Colorless	No
Fluoride	Salty, soapy	Sharp, pungent, irritating	Colorless	No
Free chlorine	Astringent	Chlorinous	Colorless	No
Hydrogen cyanide	Bitter, metallic	Almonds, peach kernels	Colorless	No
Malathion (insecticide)	Not found	Skunk, mercaptan, garlic	Yellow	No
Mercuric chloride	Bitter, metallic	Almonds, peach kernels	Colorless	No
Napthalene	Not found	Mothball-like	Colorless	Yes
Parathion (pesticide)	Not found	Rotten Onion, garlic	Colorless	Yes
Petroleum products	Not found	Pungent, hydrocarbon	Varies	Yes
Soman	Not reported	Fruity, camphor	Colorless	No
Sulfur mustard	Not reported	Garlic, mustard	Pale yellow	Yes

Ingestion of Chemical and Biological Compounds Cause Illness Complaints



Giardia lamblia
Nausea, diarrhea,
bloating, headache,
stomach cramps, weight
loss

Cryptosporidium parvum
Nausea, diarrhea, and
stomach cramps



Complaints can be Directly Linked to Free Chlorine and System Integrity

- Free chlorine loss can result in
 - A chlorine T&O change
 - Unmasking which allows detection of underlying T&Os (e.g., earthy/musty)
 - Emergence of the specific T&O (e.g., cyanide)
- Complaints indicate change

There are Several Real World Examples

- Both intentional and unintentional events
- In each case, the first indicators were consumer complaints
- Complaints aided in detection, response, and recovery of contaminated water events

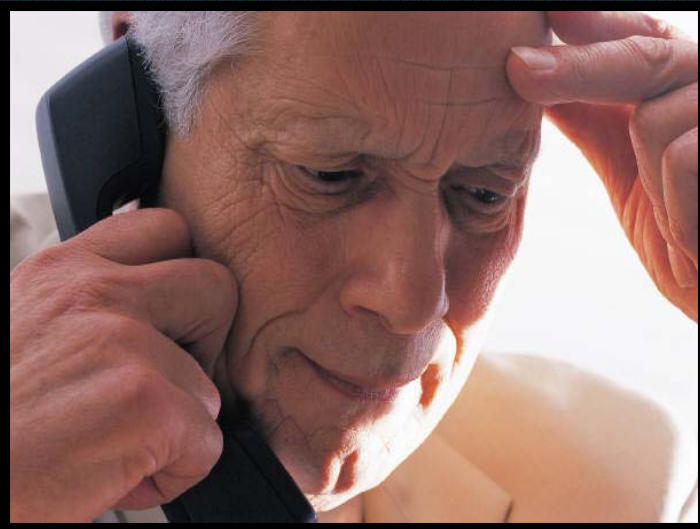


Complaints Have Been Used to Detect a Water System Attack

Date: 1980

Location: Mid-Atlantic US

Population: 10,000



- Many complaints from one portion of system
 - Kerosene-insecticide taste and odor; milky appearance
- Onsite investigation included on-the-spot sensory methods
- Caused by intentional backflow of insecticide through a hydrant

Consumer Feedback was Vital in Response and Recovery Operations

- Alerted the utility of a problem
- Used to characterize the unknown contaminant
 - T&O and appearance attributes
- Used to pinpoint the location of contaminated water
- Used to identify valves to be closed for containment



A Health Threat was Recognized because of Consumer Complaints

Date: 1988

Location: Northeast US

Population: 10,000



- Fluoridation malfunctions
- Concentrated fluoride poured into the system (40x normal; ~160 mg/L)
- Illness and aesthetic complaints filed
 - Nausea, vomiting, diarrhea, cramps, skin irritation
 - Abnormal tastes
 - Water turned blue with contact with soap
- Complaints tipped off utility

In the 1990s, a Military Installation Discovered Complaint Importance

Date: Mid-1990s

Location: Midwest US

Population: 25,000



- Contractor superchlorinated storage tank (100 mg/L chlorine)
- Valves not completely closed; water leaked into the system
- T&O complaints flooded service desk
- Complaints caused by change in free chlorine concentration
 - 1.0-2.0 mg/L chlorine normal
 - 4.0 mg/L chlorine found at taps

Green Water Detected First by PA Consumer in 2003

Date: 2003

Location: Mid-Atlantic US

Population: 1,500,000



- Service desk received “green water” complaints
- Onsite inspection and sampling conducted
- Lab tests confirmed problem and broad team assembled
- Only one 20-story building affected
- Caused by backflow of HVAC chemicals during maintenance

The Right Personnel Can Bring Expertise to the Investigation

- Typical investigators
 - Water quality manager and staff
 - Laboratory staff
 - Treatment manager
 - Distribution manager and crews
 - X-conn. control rep.
- Additional support
 - Consumer service rep.
 - Public relations staff
 - Health dept.
 - State regulatory agency

Onsite Investigations Help Characterize the Problem

- Inspect incident site
- Collect samples
- Examine a wider area
 - Single faucet, building, system area, water plant
 - Hydrant sampling helpful for area wide survey
 - Easy to do pH and chlorine
 - False-positives for bacteria and turbidity



Choosing the Right Analyses is Critical because of Time & Money



- We can't do everything all the time
- Recommended analyses
 - Odor, color, clarity inspection
 - pH, chlorine, turbidity, TDS
 - Metals analyses (e.g., copper, zinc, iron, manganese)
 - Micro. exam. for organisms

Tracking and Logging Complaints Helps Spot Area-Wide Problems

Proven tool for detecting water system attacks and aiding in response and recovery operations



Information can be collected on paper logs, electronic logs (MS® Excel), and even a GIS Database

Harnessing Complaints Benefits Detection, Response, and Recovery

- Can help protect consumers and infrastructure
 - Alerts the utility of a problem
 - Provides clues on the contaminant
 - Aides in pinpointing the problem area
 - Useful for identifying assets to close/shutdown for containment

**Opflow**
Vol. 30, No. 11 November 2004

Drinking Water Surveillance
We Need Our Customers to Complain
by Andrew J. Whelton and Margaret F. Cooney



For years public health departments have been using public feedback to detect health crises. This practice is called syndromic surveillance and is the means by which the population is monitored for behavioral patterns (e.g., purchase of over-the-counter medications, absenteeism from work or school, visits to doctors' offices or emergency rooms) or nonspecific symptoms of disease (e.g., diarrhea, vomiting, difficulty breathing, skin rashes). If the frequency of reported signs and symptoms of disease increases above a background (or normal) threshold, public health officials take a closer look.

In the aftermath of Sept. 11, 2001, many water system managers would have liked to install in their distribution systems a single device that would detect every imaginable contaminant. Unfortunately, that silver bullet does not exist. Instead, drinking water surveillance is primarily attained through a combination of detection devices and water quality monitoring measures. These early warning systems can alert utilities to contamination events and allow system operators to act quickly if water quality is compromised. But, sometimes, customers may be the first ones to notice that something is wrong with the water, which means utility response to customer complaints may be even more important now than in the past.

continued on page 4

A sunset scene with a bright orange sun low on the horizon, reflecting on the water. In the foreground, there are dark, silhouetted reeds or grasses. A semi-transparent white box with a thin black border is positioned on the left side of the image, containing contact information.

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